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### (54) System and method for video editing.

(57) The present invention provides a useful video editing system capable of reading shot directly from an original source and preparing a master tape to which vide effects such as wipes are applied and a method thereof. The video editing system comprises a video storage device for storing video data which is composed of an array of a number of frames and which can be concurrently reproduced through two channels or more, a shot information storage device for storing shot information which designates the storage location of each shot to be reproduced in the video storage device, a shot link information output device for releasing shot link information as output which specifies a link order and a link method for the shots to be reproduced, a channel allocation determining device for determining, in accordance with the shot link information, to which of the channels each shot to be reproduced should be allocated and releasing it as channel allocation information, a shot reproduction control device for accessing the video storage device to read the shots to be reproduced from the determined channels in the determined order in accordance with the shot information, the shot link information and the channel allocation information, and an effects generator device for linking the plurality of shots of the plurality of channels, which are sent from the shot reproduction control device, in the determined link method and creating video effects to be applied to the linked shots.

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When using such a prior video editing system, the user has to firstly decide whether a shot is allocated to the channel A or the channel B. In the case shown in Figure 2, since each shot is linked by a wipe, if Shot A is allocated to the channel A, Shot B, Shot C, Shot D will be allocated to the channel B, the channel A and the channel B respectively.

5 It is then checked if the contents of each shot are stored in either of the video storage units 12, 14 which corresponds to the channel to which the shot has been allocated. For example, if the contents of Shot C are not stored in the A-channel video storage unit 12 but stored in the B-channel video storage unit 14, the contents should be copied from the video storage unit 14 to the video storage unit 12 prior to starting of editing.

10 It is not until the completion of the above-described preparation that the channel allocation unit 16 prepares a link order as shown in Figure 3 in which the shots are arranged in order in relation to the channels A and B and releases the link order to the shot reproduction units 17, 18 to obtain a desired result.

15 The prior video editing system, however, has the disadvantage that since the user has to allocate, prior to starting of actual editing operation, each shot to be taken from the original source to the A-channel video storage unit 12 or the B-channel video storage unit 14 according to an editing plan imaged by the user, the operation for copying shots of the original source into the video storage units 12, 14 is required and, furthermore, it is very difficult to change the allocation once shots are allocated.

20 For example, such necessity often arises after completion of allocation that the link order of shots is altered by relocating shots after seeing an editing result or new shots are inserted into existing shot sequence. In such cases, the following troublesome operations become necessary: A shot to be relocated is copied from either one of the video storage units 12, 14 into the other while rewriting the corresponding information stored in the shot information storage unit 13 or 15; or all the shots located after an insert position are relocated between the video storage units 12, 14 while rewriting the corresponding information stored in the shot information storage units 13 and 15. The latter operation necessary in the case of newly inserting a shot in shot sequence especially requires enormous time and labor and therefore there has been a strong demand for a system and 25 method capable of facilitating such insert edit.

## SUMMARY OF THE INVENTION

It is therefore a prime object of the invention to provide a useful video editing system capable of reading 30 shots directly from an original source and preparing a master tape to which video effects such as wipes are applied.

It is another object of the invention to provide an video editing system capable of altering the link order of shots and inserting new shots in existing shot sequence without difficulties.

The above objects and advantages of the invention are achieved by a video editing system comprising:

35 video storage means for storing video data which is composed of an array of a number of frames and which can be concurrently reproduced through two channels or more;

shot information storage means for storing shot information which designates the storage location of each shot to be reproduced in the video storage means;

40 shot link information output means for releasing shot link information as output which specifies a link order and a link method for the shots to be reproduced;

channel allocation determining means for determining, in accordance with the shot link information, to which of the channels each shot to be reproduced should be allocated and releasing it as channel allocation information;

45 shot reproduction control means for accessing the video storage means to read the shots to be reproduced from the determined channels in the determined order in accordance with the shot information, the shot link information and the channel allocation information; and

effects generator means for linking the plurality of shots of the plurality of channels, which are sent from the shot reproduction control means, in the determined link method and creating video effects to be applied to the linked shots.

50 Preferably, the video storage means includes a high-speed disc medium having the ability of transferring video data at high speeds and FIFOs for storing the video data transferred from the high-speed disc medium, the number of FIFOs being the same as the number of channels.

Preferably, the channel allocation determining means comprises a first allocation unit for allocating a first shot in the shot link information to a first channel; and a second allocation unit for allocating a following shot to a channel different from a channel to which a preceding shot has been allocated, when the preceding and following shots are overlapped in terms of time at their joint.

It is also preferable that the shot reproduction control means comprises:  
a first detection unit for detecting a shot to be reproduced from the shot link information;

link information preparation unit 205, a channel allocation unit 206, a shot reproduction control unit 207 and an effects generator unit 208. The video storage unit 201 comprises a high-speed disc medium 211 storing video data in a digital form, a readout unit 212 for reading out the video data at high speeds, and a switching unit 215 for allowing the read out data to be stored in an A-channel FIFO memory 213 or a B-channel FIFO unit 214 in accordance with instruction from the shot reproduction control unit 207. Reading the data from the FIFOs 213, 214 to transfer to the shot reproduction control unit 207 is executed by one frame in synchronization with the cycle of the frames and it is possible to simultaneously read data from these FIFOs 213 and 214. The readout unit 212 can read out data in blocks so that the speed at which the readout unit 212 reads data from the high-speed disc medium 211 is satisfactorily higher than the speed at which the shot reproduction control unit 207 reads data from the FIFOs 213, 214. Note that the digitalized video data recorded on the high-speed disc medium 211 consists of a number of frames like a motion picture taken by a video camera and stored on one roll of video tape.

The shot information storage unit 202 stores, as shot information, a number assigned to each shot to be taken from an original source, the number of the frame on the original source where the shot starts and the number of the frame where the shot terminates. For example, when Shots 1 to 4 are taken from an original source M as shown in Figure 6A, the shot information is as shown in Figure 7. The shot information input unit 203 is used for entering, as input, the shot No., start frame No., termination frame No. to be stored in the shot information storage unit 202, and corresponds to the key board 103 shown in Figure 4.

The story input unit 204 is for entering the link order of shots, the number of frames to be used for a joint between shots, and a video effect to be applied to a joint.

The shot link information preparation unit 205 prepares shot link information, based on input information entered by the story input unit 204 and the shot information read from the shot information storage unit 202. Figure 6B shows an example of the shot link information, prepared from input information from the story input unit 204 and the shot information shown in Figure 7. Note that the frame Nos. in Figure 6B are those on the master tape M.

The channel allocation unit 206 allocates each shot to a channel A or a channel B in accordance with the shot link information and this allocating operation is executed in accordance with the flow chart of Figure 8. The contents of a register for storing a processing set No. (the No. of a shot being processed) is set to Shot 1 (Step 1), and then the channel A is set as the processing channel for Shot 1 (Step 2). The previous channel A or B set just before is stored in a register for storing a previous set channel (Step 3) and then, the contents of the processing set No. register are changed to the following shot, i.e., Shot 2 (Step 4). The channel stored in the previous set channel register is checked (Step 5), and if the previous set channel is A, the channel B is set for the next shot 2 (Step 6). If the preceding set channel is B, the channel A is set for the following shot 2 (Step 7). The above steps (Step 3 to Step 7) are repeated up to the last shot No. of the shot link information (Step 8) and thereafter, the channel allocation operation is completed.

The shot reproduction control unit 207 controls the operation for reading video data from the video storage unit 201, in accordance with the channel allocation information for each shot that is sent from the channel allocation unit 206, the shot information from the shot information storage unit 202 and the shot link information from the shot link information preparation unit 205. This control operation is shown in Figure 9. The operation is started by depression of a reproduction button operated by the operator (Step 10). Specifically, after the reproduction button has been depressed, time is set to a 0th frame (Step 11) and the shot link information is read (Step 12). Since the shot link information indicates as shown in Figure 6B that Shot 1 is reproduced at the 0th frame, the program proceeds from Step 13 to Step 14 and Step 15, where the shot information and channel allocation information for Shot 1 are read. Thereafter, the starting frame of Shot 1 stored in the video storage unit 201 is specified (Step 16), and a block of video data is transferred from the starting frame to the A-channel FIFO 213 (Step 17). At the same time, the video data is read from the FIFO 213 to be transferred to the effects generator unit 208 (Step 18). Thereafter, time (frame No.) is updated (Step 19), and Step 13, Step 20, Step 21, Step 22, Step 23, Step 19 and Step 13 are executed in this order, thereby reading out Shot 1. According to the shot link information, when the current time reaches a 200th frame, readout of Shot 2 starts. According to the shot link information, when the current time reaches a 400th frame, readout of Shot 2 starts and therefore, the operation for reading data from the channel B is concurrently performed (Steps 14 to 18, Step 24, Step 25, Step 26).

When a 250th frame is reached, the readout of Shot 1 is completed, so that the program proceeds to Steps 27 to 30 and the readout from the A-channel FIFO is thus completed. On the other hand, the readout of Shot 2 alone from the B-channel FIFO 214 is continued up to a 400th frame.

According to the shot link information, readout of Shot 3 starts when the 400th frame is reached and, therefore, Shot 3 is transferred from the high-speed disc medium 211 to the A-channel FIFO 213 and at the same time, Shot 3 is read from the FIFO 213. Similarly, the following shots designated by the shot information are read and transferred in accordance with the shot link information to the respective channels to which those

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5	400	repro- duction of Shot 3 starts	900th frame in video storage is accessed  block transfer of video data to A-channel FIFO starts	transition from channel B to channel A starts
10			reading of video data from A-channel FIFO to transfer to effects generator starts	
15				
20	430	repro- duction of Shot 2 is completed	block transfer of video data to B-channel FIFO is completed  reading of video data from B-channel FIFO to transfer to effects generator is completed	transition from channel B to channel A is complet- ed (A-channel 100% now)
25				
30	600	repro- duction of Shot 4 starts	7500th frame in video storage is accessed  block transfer of video data to B-channel FIFO starts	transition from channel A to channel B starts
35				
40			reading of video data from B-channel FIFO to transfer to effects generator starts	
45				

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## (Second Embodiment)

Figure 12 shows a second embodiment of the invention. In the second embodiment, the video storage unit 201 includes two VTRs 221, 222 in which tapes 223, 224 having the exactly same video data are adapted for reproduction. Since the video data of the channel A and the video data of the channel B are the same and are released at the same time from the video storage unit 201, the shot reproduction control unit 207 reads the video data of the two channels from the video storage unit 201 in accordance with the channel allocation information, shot information and shot link information to release to the effects generator unit 208. In consequence, the edited videos to be obtained after being subjected to the processing by the effects generator unit 208 will be exactly the same as those of the first embodiment. As other components than the video storage unit 201 in the second embodiment are basically substantially identical with those of the first embodiment, an explanation will be omitted. Although two VTRs are used in the second embodiment, it is also possible to employ other arrangements instead of VTRs only if they include a plurality of independently operative heads.

In the first embodiment, high-speed video reproduction is achieved using a high-speed disc medium in combination with FIFO memories for video data, but it could be also achieved in such a way that data is compressed and stored in the video storage unit and is reproduced by video expansion in the shot reproduction control unit.

The invention has been particularly described with the case in which wipes are created in the effects generator unit; however, it is not necessarily limited to such a case and the effect to be created could be other video effects such as dissolves or shot link.

Although the present invention has been fully described by way of example with reference to the accompanying drawings, it is to be noted that various changes and modification will be apparent to those skilled in the art. Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

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## Claims

## 1. A video editing system comprising:

30       video storage means for storing video data which is composed of an array of a number of frames and which can be concurrently reproduced through two channels or more;  
      shot information storage means for storing shot information which designates the storage location of each shot to be reproduced in the video storage means;  
      shot link information output means for releasing shot link information as output which specifies a  
35       link order and a link method for the shots to be reproduced;  
      channel allocation determining means for determining, in accordance with the shot link information, to which of the channels each shot to be reproduced should be allocated and releasing it as channel allocation information;  
      shot reproduction control means for accessing the video storage means to read the shots to be  
40       reproduced from the determined channels in the determined order in accordance with the shot information, the shot link information and the channel allocation information; and  
      effects generator means for linking the plurality of shots of the plurality of channels, which are sent  
45       from the shot reproduction control means, in the determined link method and creating video effects to be applied to the linked shots.

## 2. A video editing system according to Claim 1, wherein the video storage means includes a high-speed disc medium having the ability of transferring video data at high speeds and FIFOs for storing the video data transferred from the high-speed disc medium, the number of FIFOs being the same as the number of channels.

## 3. A video editing system according to Claim 2, wherein the channel allocation determining means comprises a first allocation unit for allocating a first shot in the shot link information to a first channel; and a second allocation unit for allocating a following shot to a channel different from a channel to which a preceding shot has been allocated, when the preceding and following shots are overlapped in terms of time at their joint.

4. A video editing system according to Claim 3, wherein the shot reproduction control means comprises:  
      a first detection unit for detecting a shot to be reproduced from the shot link information;

Fig. 1

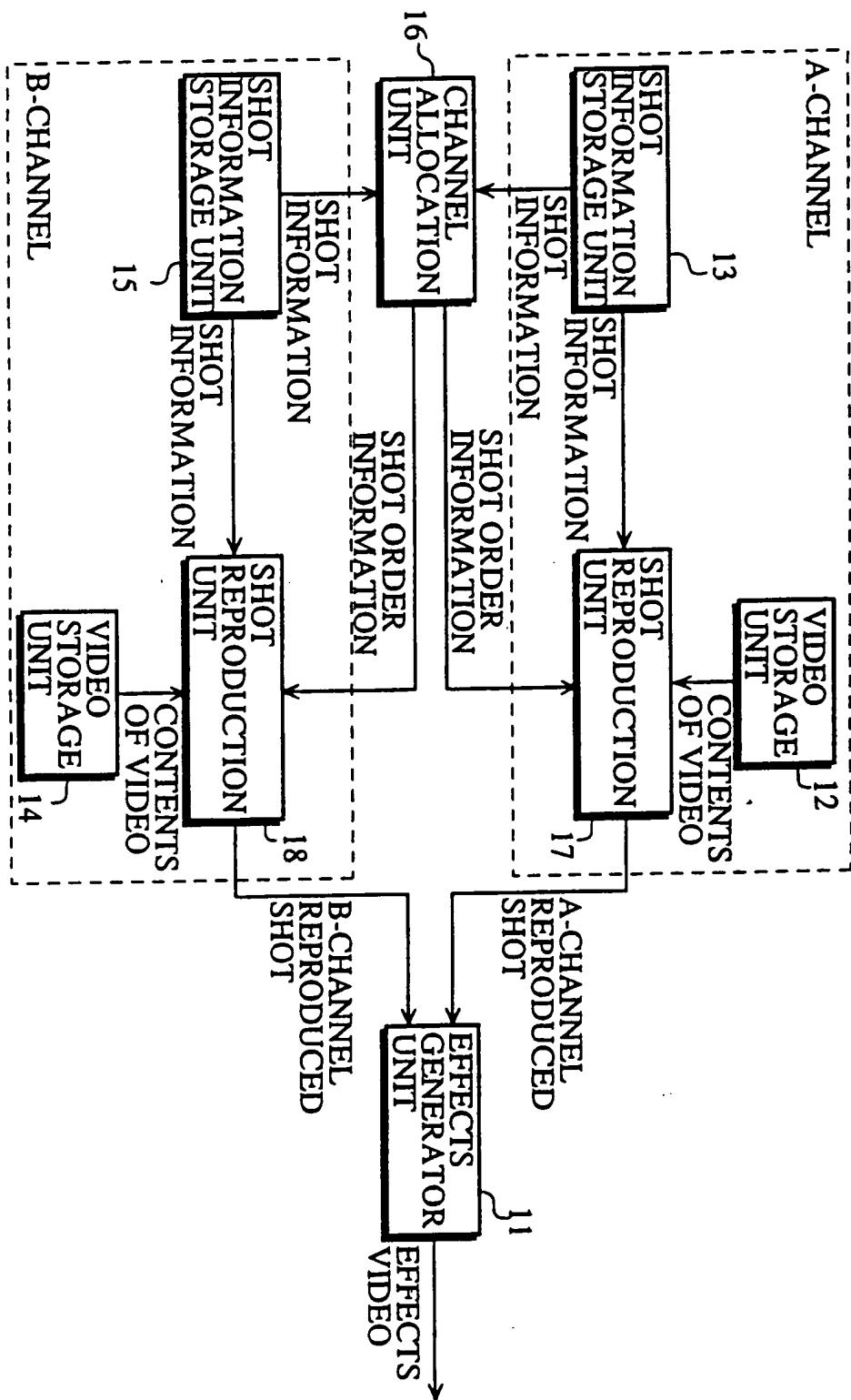


Fig.3

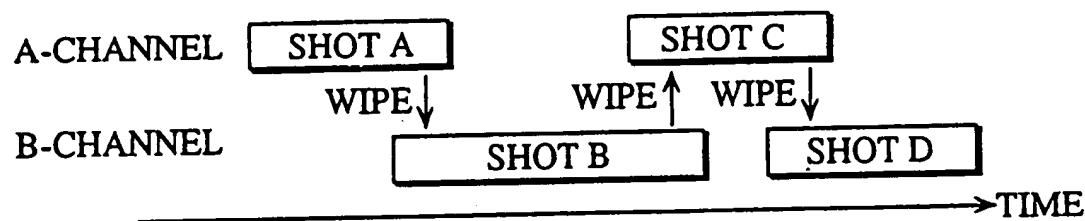


Fig.5

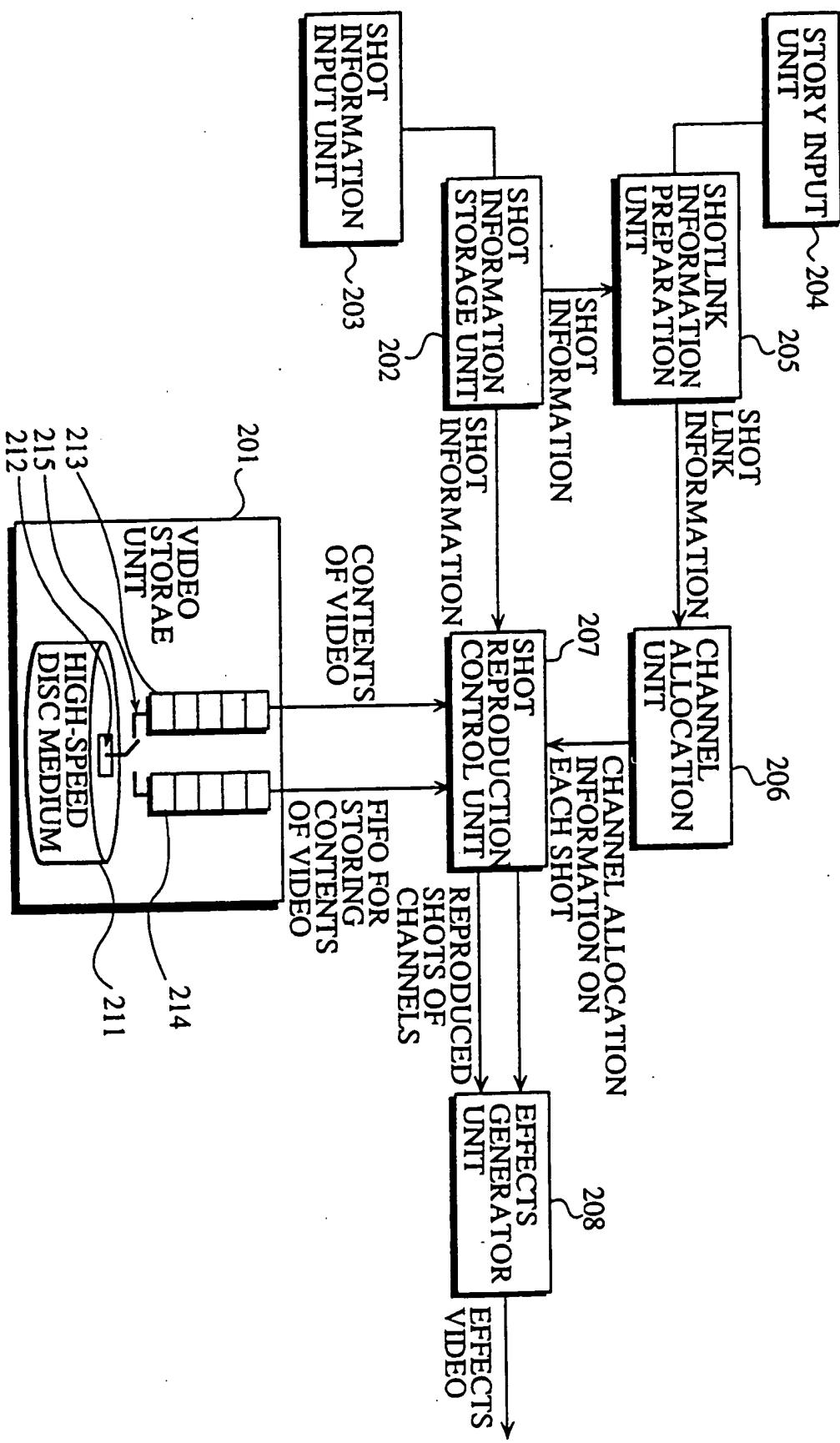


Fig.7

SHOT NO.	START FRAME NO.	TERMINATION FRAME NO.
SHOT 1	100	350
SHOT 2	6500	6730
SHOT 3	900.	1160
SHOT 4	7500	7700

Fig.9

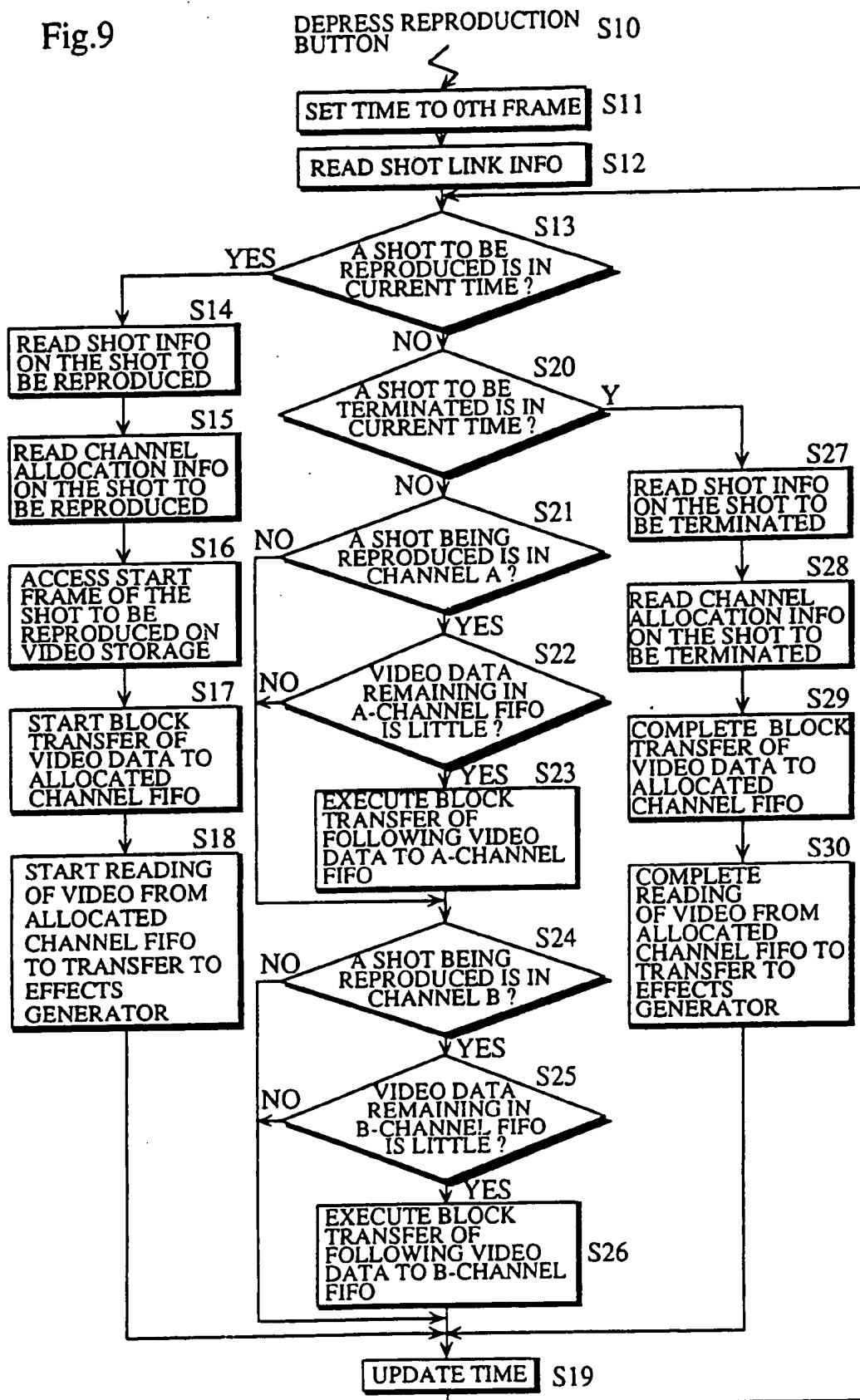


Fig.11A

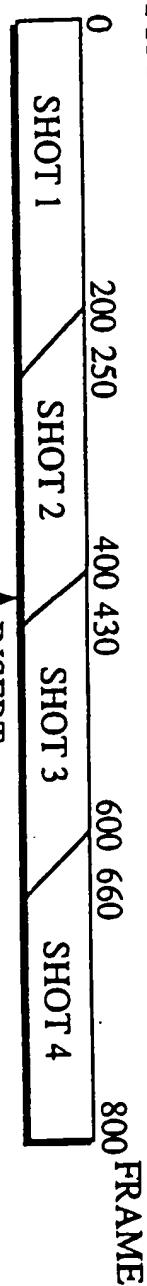


Fig.11B

SHOTS 2 AND 3 ARE ONCE CONNECTED BY SCENE LINK

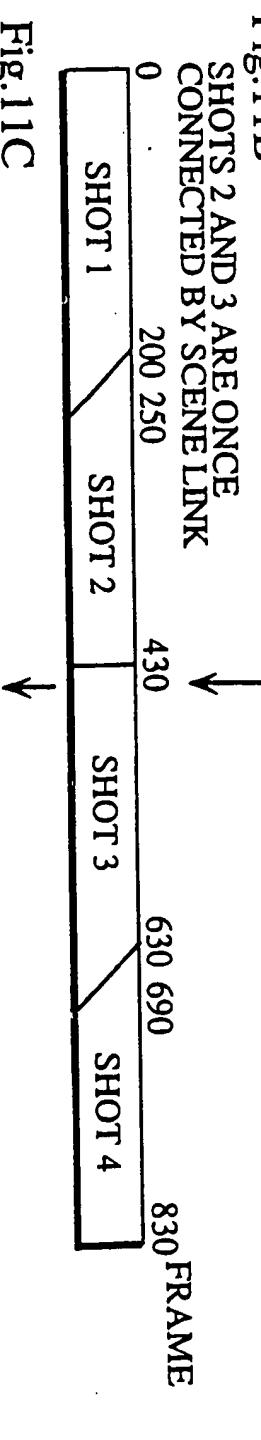


Fig.11C

SHOT 5 IS INSERTED  
DESIRED TRANSITIONS ARE SET BY USER FOR THE JOINTS BETWEEN SHOTS 2 AND 5 AND BETWEEN SHOTS 5 AND 3

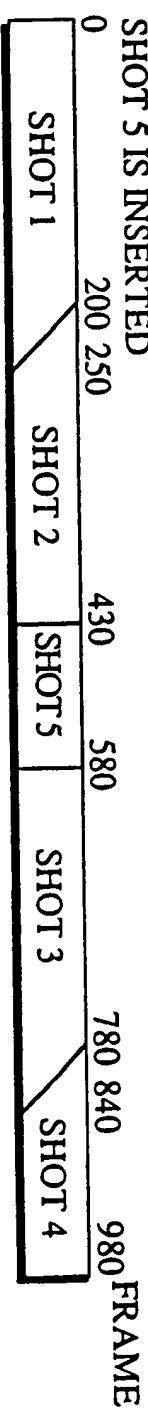
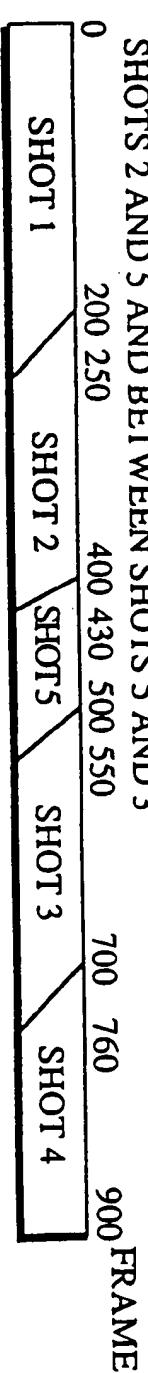


Fig.11D

DESIRED TRANSITIONS ARE SET BY USER FOR THE JOINTS BETWEEN SHOTS 2 AND 5 AND BETWEEN SHOTS 5 AND 3



EXAMPLE OF SHOT INSERTING OPERATION IN SHOT LINK INFORMATION PREPARATION UNIT



(12)

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## (54) System and method for video editing

(57) The present application describes a video editing system capable of reading shot directly from an original source and preparing a master tape to which video effects such as wipes are applied and a method thereof. The video editing system comprises a video storage device for storing video data which is composed of an array of a number of frames and which can be concurrently reproduced through two channels or more, a shot information storage device for storing shot information which designates the storage location of each shot to be reproduced in the video storage device, a shot link information output device for releasing shot link information as output which specifies a link order and a link method for the shots to be reproduced, a channel allocation determining device for determining, in accordance with the shot link information, to which of the channels each shot to be reproduced should be allocated and releasing it as channel allocation information, a shot reproduction control device for accessing the video storage device to read the shots to be reproduced from the determined channels in the determined order in accordance with the shot information, the shot link information and the channel allocation information, and an effects generator device for linking the plurality of shots of the plurality of channels, which are sent from the shot reproduction control device, in the determined link method and creating video effects to be applied to the linked shots.

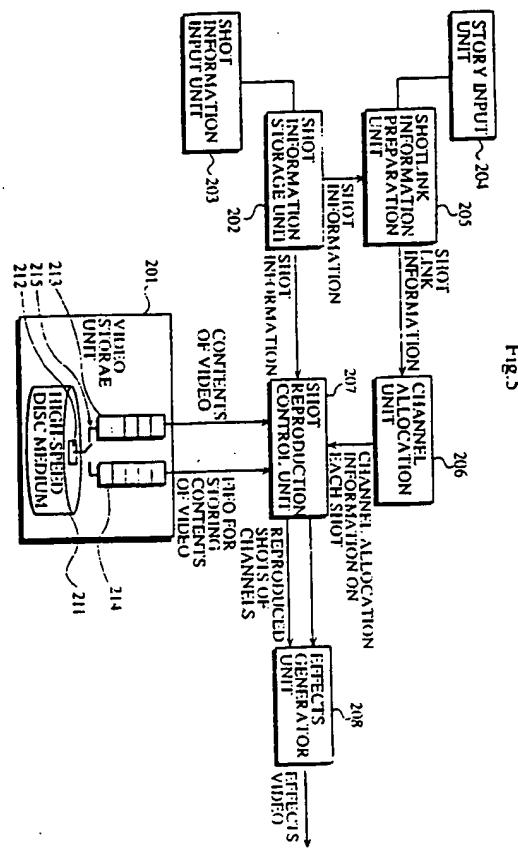


Fig. 5



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## EUROPEAN SEARCH REPORT

Application Number  
EP 93 30 8042

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.CLS)						
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim							
A	PATENT ABSTRACTS OF JAPAN vol. 16 no. 373 (P-1400) ,11 August 1992 & JP-A-04 117686 (FUJITSU LTD) 17 April 1992, * abstract *	1,6,10 -----							
			TECHNICAL FIELDS SEARCHED (Int.CI:5)						
<p>The present search report has been drawn up for all claims:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Place of search</td> <td style="width: 33%;">Date of completion of the search</td> <td style="width: 34%;">Examiner</td> </tr> <tr> <td>BERLIN</td> <td>15 March 1996</td> <td>Beitner, M</td> </tr> </table>				Place of search	Date of completion of the search	Examiner	BERLIN	15 March 1996	Beitner, M
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BERLIN	15 March 1996	Beitner, M							
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document							